

### **Remarks/Arguments**

In the Office Action mailed July 18, 2003, the Examiner rejected claims 1-9, and 11-22 and 24-29 under 35 U.S.C. §102(e) over U.S. Patent No. 6,435,277 to Qu et al. Claims 1, 6, 7, 14, 15, 17-21 and 25-29 are rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,627,144 to Urfer. Finally, Claims 1-9, and 11, 12, 14, 15, 17, 19-22 and 24-28 are rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,246,072 to Frazier.

In response to the rejections applicants provide the following distinguishing remarks that are believed to place the present case in condition for allowance. Favorable reconsideration of all the pending claims is respectfully requested.

### **The Claimed Invention**

The present invention generally relates to compositions and methods for improving the injectivity of water injection wells thereby restoring permeability to the formation and enhancing the recovery of oil by the waterflood process.

Petroleum is generally recovered from subterranean formations by penetrating the formation and establishing fluid communication with one or more wells and pumping or permitting the petroleum to flow to the surface. This method of recovery called primary recovery ordinarily recovers only 20-30% of the petroleum existing in the formation.

Once primary recovery has ceased, secondary recovery methods such as water flooding techniques are often called for. Secondary recovery is accomplished by penetrating the formation with an injection well and establishing fluid communication. Water or steam is then forced into the injection well and petroleum and water are recovered at the recovery well. Petroleum recovery in water-wells is, however, inherently low. More particularly, in a porous subterranean oil-containing formation, the pores in the area adjacent to the well bore have a tendency to become

clogged with synthetic and biological matter which restricts the flow of aqueous fluids such as drive fluids into the injection well in a petroleum recovery process. With time, the accumulation of plugging materials becomes sufficient to substantially reduce the permeability of the formation fact to the drive fluid, which greatly impairs petroleum recovery.

The present invention provides an improved and environmentally friendly method of restoring the permeability to injection wells that are plugged by various biological and synthetic organic debris and for improving the overall recovery rate of secondary recovery methods. The claimed method comprises treating said formation with a composition which comprises at least one nonionic surfactant and at least one cationic surfactant in an amount and a concentration effective to improve the permeability of said formation, wherein said at least one nonionic surfactant is selected from the group consisting of alkanolamides, alkoxylated alcohols, alkoxylated amines, alkyl phenyl polyethoxylates, lecithin, hydroxylated lecithin, fatty acid esters, glycerol esters and their ethoxylates, glycol esters and their ethoxylates, esters of propylene glycol, sorbitan, ethoxylated sorbitan polyglycosides and mixtures thereof, and said at least one cationic surfactant is an ethoxylated quaternary ammonium compound.

Concerning the rejections of record the examiner is respectfully requested to note that claims 19-29 have been canceled. Accordingly, the rejection thereof is now moot.

**I. The Rejection Claims 1-9, 11-22 and 24-29 Under 35 U.S.C. §102(e) Over U.S. Patent No. 6,435,277 to Qu et al.**

The claimed invention is specifically directed to a method for improving the injectivity of water injection wells by restoring permeability to the formation, thereby enhancing the recovery of oil by the waterflood process. The application method and mechanism of operation are both totally different than that of Qu et al. More

specifically, the claimed invention relates to a method for improving the water injectivity of injection wells by restoring the permeability of the formation by pumping a fluid that contains at least one non-ionic surfactant and at least one non-ionic surfactant. This is called **tertiary recovery of oil** and it involves water floods (**Application**) in injection wells. The claimed method is useful in removing or cleaning drilling residues, sludges, paraffin, mud solids, biological or synthetic solids that have drastically reduced the permeability of the formation. Once cleaned of such debris, the permeability of the formation is improved/restored and injectivity is improved. Basically, this is a **cleaning mechanism**.

On the other hand, the Qu et al.'s application is for "diversion" purposes, i.e. when fracturing (**secondary oil recovery**) or treating a formation that has a water zone and an oil zone, they use the water-based fracturing fluid to "block" the water bearing zones using a surfactant capable of generating micelles (viscosity). This fluid will loose its viscosity in the oil bearing zones as the micelles will break up upon contact with the oil. The surfactant therefore serves to divert the fracturing fluid from the water zones into the oil zones, thus minimizing the production of water in favor of the production of oil once the well is put into production (**diversion mechanism**).

Accordingly, applicants respectfully submit that Qu et al clearly fails to disclose or suggest the claimed method and as such, is insufficient to reject the claims under Section 102. Reconsideration and withdrawal of the subject rejection is therefore respectfully solicited.

**II. The Rejection Claims 1-6, 7, 14, 15, 17-21 and 25-29 Under 35 U.S.C. §102(b)**  
**Over U.S. Patent No. 5,627,144 to Urfer et al.**

Urfer et al. clearly fails to disclose the claimed method for improving the injectivity of water injection wells by restoring permeability to the formation, thereby enhancing the recovery of oil by the waterflood process. In fact, Urfer et al. even

fails to disclose a composition containing an alkoxylated quaternary ammonium compound that applicants employ in the claimed method. As such, the present rejection is believed to be improper; reconsideration and withdrawal thereof is respectfully requested.

**III. The Rejection Claims 1-9, 11, 12, 14, 15, 17, 19-22 and 24-28 Under 35 U.S.C. §102(b) Over U.S. Patent No. 5,246,072 to Frazier et al.**

Frazier et al describes a foam forming composition and to a method for recovering hydrocarbons from a formation **during the injection of a gas**. A problem with such methods is due to the viscosity and density differences between the gas and the oil, i.e., because the gas employed typically has only 5-10% of the viscosity of oil, the gas tends to bypass much of the oil when flowing through the pores of the reservoir rock. The purpose of the foam is to inhibit the flow of the gas into that portion of the formation containing only residual oil saturation. In addition, the foam physically blocks the channels through which the foam is short-cutting.

It is clear, however, that Frazier et al. clearly fails to disclose the claimed method for improving the injectivity of water injection wells by restoring permeability to the formation, thereby enhancing the recovery of oil by the waterflood process. The present rejection is therefore believed to be improper; reconsideration and withdrawal thereof is respectfully requested.

In view of the amendments and remarks herein, all of the pending claims are believed to be in condition for allowance, which action is respectfully solicited.

Respectfully submitted,



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